CEMA
European Agricultural Machinery Association

Renewable and Low-Carbon Fuels for Climate-Smart EU Agricultural Machinery: Circular Agriculture in Action

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Executive summary

CEMA is the association representing the European agricultural machinery industry. With 11 national member associations, the CEMA network represents both large multinational companies and numerous European SMEs active in the sector. The industry comprises about 7,000 manufacturers, producing more than 450 different types of machines with an annual turnover of about €40 billion (EU28 - 2016) and 150,000 direct employees.

CEMA welcomes the EU Commission's "Fit for 55" package and would like to contribute to the public discussion on how the use of fossil energies can be overcome. Every sector must commit to an absolute reduction of its CO2 footprint. The agricultural sector accounts for ~10% of the total of the EU27 greenhouse gas (GHG) emissions (from crops, livestock, and soils), and an additional ~1% of total EU27 GHG emissions can be attributed to agriculture from the combustion of fossil fuels during the normal course of operating agricultural machinery. **Conventional fuel** is therefore **still a contributor to the overall agricultural carbon footprint.**

Approaches to reduce the CO_2 footprint of agricultural machinery are multiple, ranging from efficiency gains in the agricultural production process using best practices to the utilisation of alternative drives and fuels. Agricultural equipment is characterised by its extremely robust and reliable construction, resulting in a long service life. The high average age of the agricultural machinery fleet powered by a combustion engine, and thus solutions for the current fleet, needs to be considered for planning any transition of engine technologies and energy solutions.

Currently, due to the nature and complexity of agricultural production, there is no single technology or energy carrier capable of entirely replacing conventional technology. There may not be 'one size fits all' solution. A mix of technologies and energy carriers, most suitable for a given production system, certain region, farm size and condition, will have to be identified and applied. In this framework farmers will have a key role to play as prosumers (both producers and consumers of energy), since they will be able to contribute to energy production with solar panels, windmills, oil mills/mini-refineries and biogas/ biomethane plants.

Technological progress in the coming decade aimed at solving issues of weight, energy density and fast refuelling of on-board energy storage for a sustainable operating range will define the long-term potential uptake of electrification. So far, for the short and mid-term, **full electrification seems more feasible for small-sized low-powered agricultural machines, while for mid- and large-sized machines and for high- power applications it is not an alternative to combustion engines.** The development of these technologies is a key element of the path to a zero carbon commitment.

For most of the EU agricultural machinery fleet to deliver a significant CO_2 reduction, **renewable and low-carbon fuels, notably liquid and gaseous biomass fuels, green hydrogen and e-fuels will be an important source of energy**, with which the internal combustion engine will remain a viable and suitable solution. Both liquid biomass fuels and e-fuels can be blended with fossil fuels, some with maximum volume percentage caps and under certain conditions, such as with regards to quality.

Green hydrogen could be used directly in combustion engines. Due to significant investment in hydrogen production in the heavy-duty sector, it can also be a viable option for farmers, particularly if uncertainties can be overcome on hydrogen production capacity, logistics and storage on the farm and vehicle.

For sustainable biomass fuels, the main types identified are renewable diesel (HVO), biomethane, biodiesel (FAME) and pure vegetable oil. Sustainable biomass fuels can reduce GHG emissions by at least 60% and biomethane from waste and manure by potentially more than 200%, when compared to fossil diesel. Each of these fuels has its benefits and challenges for production, storage, and use. For example, HVO is a drop-in replacement fuel which can be utilised in current engines without changes to the engine's homologation. Some biomass fuels and fuel blends are missing standards and obstacles related to the engine's homologation process remain.

Given the limitation of biomass sources, prioritisation of available biofuels is as important as scaling up their availability. Within a concept of **decentralised biomass fuels' supply**, a portion of biofuels can be produced locally, either using on farm oil mills/mini-refineries and biogas/biomethane plants or in regional value chains, that include the processing industry, with an increased use of manure and agricultural organic waste. This structure allows the production of sustainable biomass fuels to contribute to **circular agriculture**. In addition, biomethane processed from fugitive emissions from livestock manure can not only contribute to delivering a circular economy model for livestock agriculture but also assist in solving the ammonia and methane emission problem.

In the context of the Green Deal, **new production methods can contribute to the optimised and additional supply of crops which could supplement the mix of sustainable biomass fuel feedstocks**. This can be achieved not only through crop diversification, for example using multi-cropping, intercropping and rotation extension, but also through permanent ground coverage and an increase in soil biodiversity for optimal carbon sequestration.

Agriculture, as part of a circular economy, **can only become sustainable when it overcomes its major dependency on fossil fuel**. Alternative fuels and electrification can enhance farmers' operational flexibility, efficiency, and even profitability, while dramatically offsetting their carbon footprint. The production of biofuels can also provide new business opportunities for farmers in the form of digested biomass for fertilisation, vegetable proteins for food and feed, on farm heating, and electricity generation. As **biomass fuels** provide more options for farmers to contribute to the reduction of CO_2 to meet targets, as well as the additional opportunity for diversification of the farm business model, they **are not just a transition fuel to be used until 2030 but also a valuable fuel option beyond this decade**. Biomass fuels could be primarily preserved for the use in agriculture and also serve to increase the share of renewable energies in the overall power mix, such as within the RePowerEU initiative.

Another suitable future drop-in replacement fuel option are e-fuels. The prohibitively high prices for e-fuels originating from combining carbon with green hydrogen can only be addressed by rolling out production at sufficient scale, in regions with high energy yields from wind, solar and other renewable energy sources. The related industry will only invest if there is a stable demand for high volumes of e-fuels to justify such investment. To that end, the agricultural sector must be considered **a 'hard to abate' sector, similar to aviation and maritime shipping, that is in need of renewable fuels for the medium and long term**.

The higher cost of most renewable and low-carbon fuels compared to fossil diesel, the lack of economic incentives for production and usage of these fuels in agricultural machines, coupled with uncertainties surrounding fuel taxation and subsidy regulations, are amongst the significant risks for their broader uptake by EU farmers. The simplest means to achieve the Green Deal targets in agriculture is to make these sustainable fuels a more attractive alternative.

Therefore each fuel should be taxed in accordance with its climate contribution; based on the same principle, subsidy schemes targeting production, storage and use of those fuels should be deployed. Additionally, a long-term alignment is necessary between the EU regulations and national initiatives around the promotion of different fuels that could be expected to be used in agriculture.

Within a long-term EU vision and plan, well-targeted programs are needed to **financially support farmers' and contractors' investments in their machinery fleet and fuelling infrastructure**, for their access to the best available CO_2 friendly technologies and/or adjustment to harmonised practices for energy-optimised agricultural production.

As there is no single solution for all economic players, agricultural investment support programs must fit with the advancing developments of other sectors, the availability of energy carriers and technologies, and the specific energy needs of agricultural operations to maximise the full potential benefit for every use case and end market.

In summary, due to the characteristics of the agricultural machinery fleet and the work it must perform, CEMA believes that the internal combustion engine remains a viable and suitable solution for the coming decade to deliver on the CO_2 reduction targets. We call on the promotion, production, and use of renewable and low-carbon fuels for agricultural machinery, whilst other technologies (e.g., electrification or green hydrogen) come to maturity.

Read the full paper:

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